1. INTRODUCTION

Chapter 1 provides an overview of the U.S. Department of Energy's proposal for treatment and management of sodium-bonded spent nuclear fuel. This chapter discusses the background, purpose and need for agency action, and scope of the *Environmental Impact Statement for the Treatment and Management of Sodium-Bonded Spent Nuclear Fuel*. Included are discussions on the decisions to be made and issues identified by the public during the scoping period. The chapter concludes with sections on the relationship of this proposal to other actions and programs under the National Environmental Policy Act and the organization of the document.

1.1 BACKGROUND

For nearly four decades, research, development, and demonstration activities associated with liquid metal fast breeder reactors were conducted at the Experimental Breeder Reactor-II (EBR-II) near Idaho Falls, Idaho; the Enrico Fermi Atomic Power Plant at Monroe, Michigan; and the Fast Flux Test Facility at the Hanford Site in Richland, Washington. These activities generated approximately 60 metric tons of heavy metal of sodium-bonded spent nuclear fuel for which the U.S. Department of Energy (DOE) is now responsible. Sodium-bonded spent nuclear fuel is distinguished from commercial nuclear reactor spent nuclear fuel by the presence of metallic sodium, a highly reactive material; frequently by metallic uranium, which is also potentially reactive; and in some cases, highly enriched uranium. Metallic sodium in particular presents challenges for management and ultimate disposal of this spent nuclear fuel. For example, metallic sodium reacts with water to produce explosive hydrogen gas and corrosive sodium hydroxide; both could affect operation of a geologic repository.

DOE proposes to resolve this problem by treating and managing the sodium-bonded spent nuclear fuel and facilitate its ultimate disposal in a geologic repository. The reasonable alternatives for this proposed action are determined by the technology options available to DOE. Several technologies that might be used to treat and manage DOE's sodium-bonded spent nuclear fuel are at various stages of development. Among these are: an electrometallurgical treatment process; the plutonium-uranium extraction (PUREX) process; placement of the spent nuclear fuel in high-integrity cans; a melt and dilute process; a glass material oxidation and dissolution system (GMODS) process; a direct plasma arc-vitreous ceramic process; and a chloride volatility process.

The programmatic risk in implementing any of these potential alternatives for treatment and management of sodium-bonded spent nuclear fuel, or of not treating this fuel, is the uncertainty surrounding the acceptability of DOE spent nuclear fuel for placement in a potential geologic repository. While DOE has drafted preliminary waste acceptance criteria for a geologic repository (DOE 1998a), the final acceptance criteria will be more refined. If the repository is developed, final acceptance criteria would not be available until after the U.S. Nuclear Regulatory Commission (NRC) issues its construction authorization, based on the successful demonstration of the safe, long-term performance of the repository in accordance with NRC regulations. Until such time, the preliminary acceptance criteria will tend to be conservative to allow for uncertainties in the performance of engineered and natural barriers and how such performance might impact public and worker health and safety, as well as material isolation.

This environmental impact statement (EIS) follows the June 1, 1995, Record of Decision (60 FR 28680) for the *Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Final Environmental Impact Statement* (Programmatic Spent Nuclear Fuel EIS) (DOE 1995a), in which DOE decided to regionalize spent

nuclear fuel management by fuel type for DOE-owned spent nuclear fuel. DOE also decided to: (1) continue environmental restoration activities at the Idaho National Engineering and Environmental Laboratory (INEEL); (2) develop cost-effective treatment technologies for spent nuclear fuel and waste management; and (3) implement projects and facilities to prepare waste and treat spent nuclear fuel for interim storage and final disposition. This Record of Decision was partially based on the conclusions of the Programmatic Spent Nuclear Fuel EIS (DOE 1995a), which analyzed the potential environmental consequences of alternatives for transporting, receiving, processing, and storing spent nuclear fuel under DOE's responsibility for the next 40 years. It also analyzed the consequences of 10 years of waste and spent nuclear fuel management and environmental restoration actions at Idaho National Engineering Laboratory.[1]

In addition, DOE committed to remove all spent nuclear fuel from Idaho by 2035 in a 1995 agreement with the State of Idaho [Settlement Agreement and Consent Order (Idaho 1995) issued on October 17, 1995, in the actions of *Public Service Co. of Colorado v. Batt*, No. CV 91-0035-S-EJL (D. Id.), and *United States v. Batt*, No. CV 91-0054-EJL (D. Id.)]. Currently, more than 98 percent of DOE's sodium-bonded spent nuclear fuel is located at INEEL near Idaho Falls, Idaho, and is subject to the requirements of this Settlement Agreement and Consent Order. Before sodium-bonded spent nuclear fuel can be removed from the State of Idaho for ultimate disposal, some or all of the fuel may require treatment.

One of the technologies considered for the treatment of sodium-bonded spent nuclear fuel is the electrometallurgical technology. In a 1995 report (NAS 1995), the National Academy of Sciences' National Research Council committee on electrometallurgical techniques for DOE spent nuclear fuel treatment recommended that DOE confirm the technical feasibility and cost-effectiveness of electrometallurgical treatment of its sodium-bonded spent nuclear fuel. The Council recommended this be done through a technology demonstration using sodium-bonded spent nuclear fuel that had been removed from EBR-II at Argonne National Laboratory-West (ANL-W). Prior to acting on the recommendation, DOE prepared the *Environmental Assessment for the Electrometallurgical Treatment Research and Demonstration Project in the Fuel Conditioning Facility at Argonne National Laboratory-West* (DOE 1996a) and issued a Finding of No Significant Impact on May 22, 1996 (61 FR 25647). The electrometallurgical treatment research and demonstration project, which began in June 1996, involves the treatment of 100 EBR-II driver assemblies and up to 25 EBR-II blanket assemblies (approximately 1.6 metric tons of heavy metal). The driver fuel contains highly enriched uranium and was used in the active region of the nuclear reactor core. The blanket fuel contains depleted uranium and was used in areas around and near the driver fuel in the reactor core. The electrometallurgical treatment research and demonstration project is scheduled to be completed in August 1999. After completing the demonstration project, DOE will need to take further action to prepare the rest of the sodium-bonded fuel for disposal.

Parallel to the assessment provided in this *Environmental Impact Statement for the Treatment and Management of Sodium-Bonded Spent Nuclear Fuel* (SBSNF EIS), the National Research Council is continuing to evaluate the electrometallurgical treatment research and demonstration project. In its most recent report, *Electrometallurgical Techniques for U.S. Department of Energy Spent Fuel Treatment–Spring 1998 Status Report on Argonne National Laboratory's R&D Activity* (NAS 1998), the Council acknowledged progress in the demonstration and recommended that it be carried to completion. Data from the ongoing demonstration project were used in preparing this Draft SBSNF EIS. The National Research Council will issue a final report on the waste forms generated by the technology demonstration after the August 1999 completion of the project. DOE will consider the Council's final report in preparing the Final EIS and reaching a decision regarding the disposition of sodium-bonded spent nuclear fuel.

[1] *The laboratory's name was changed to Idaho National Engineering and Environmental Laboratory in January 1997.*

1.2 PURPOSE AND NEED FOR ACTION

Sodium-bonded spent nuclear fuel contains metallic sodium. The presence of metallic sodium in the sodium-bonded spent nuclear fuel could complicate the disposal certification and licensing for the ultimate disposal of this spent nuclear fuel in a geologic repository. Metallic sodium reacts vigorously with water or moist air, producing heat, potentially explosive hydrogen gas, and sodium hydroxide, a corrosive substance. Sodium also is pyrophoric (i.e., a material that is susceptible to spontaneous ignition and continuous combustion). Sodium metal was used as a heat-transfer medium within the stainless steel cladding (outer layer) of the nuclear fuel and as a coolant in the nuclear reactors which used these fuels. To the extent possible, sodium was removed from the external surfaces of these fuels after their use, but a portion remains bonded to the uranium metal alloy fuel within the cladding and cannot be removed without further treatment. Most (i.e., 99 percent by weight) of the sodium-bonded spent nuclear fuel contains metallic uranium and plutonium. Some metals, such as pure uranium and pure plutonium, are reactive in the presence of air and moisture. The repository acceptance criteria probably will exclude reactive materials unless their packaging minimizes the probability of rapid oxidation (DOE 1998b). Finally, some of the sodium-bonded spent nuclear fuel contains highly enriched uranium, and its disposal in a geologic repository may require special criticality control measures.

The presence of reactive or pyrophoric materials such as metallic sodium and metallic uranium, or the presence of highly enriched uranium, could complicate the process of certification of the spent nuclear fuel for disposal. Such qualification would require sufficient data and predictive analyses to demonstrate that emplacement of the spent nuclear fuel would not adversely affect a repository's ability to protect the environment and worker and public health and safety.

To ensure that the State of Idaho Settlement Agreement is met, and to facilitate disposal, DOE needs to reduce the uncertainties associated with qualifying sodium-bonded spent nuclear fuel for disposal. Appropriate treatment and management of the sodium-bonded spent nuclear fuel would significantly reduce complications related to disposal qualification. Technologies for spent nuclear fuel treatment that could facilitate such qualification therefore should be considered in reaching a decision for treatment of DOE-owned sodium-bonded fuels. Several treatment technologies are at various stages of development and could be used to remove and stabilize the metallic sodium and immobilize or isolate the transuranic and fission products that are in the sodium-bonded spent nuclear fuel. Such technologies include the electrometallurgical treatment process; the PUREX process; placement of the spent nuclear fuel in high-integrity cans; a melt and dilute process; the GMODS process; a direct plasma arc-vitreous ceramic process; and a chloride volatility process.

It is prudent to evaluate these alternative treatment technologies now, while DOE is performing site characterization activities for a potential geologic repository at Yucca Mountain, Nye County, Nevada. Potential waste forms resulting from treatment or packaging of sodium-bonded spent nuclear fuel should be developed as much as possible in parallel with any repository development to promote consistency between the two efforts and to minimize programmatic risks associated with waste form qualification and acceptance for ultimate disposal.

1.3 ISSUES IDENTIFIED DURING SCOPING PERIOD

On February 22, 1999, DOE published in the *Federal Register* a Notice of Intent to prepare an *Environmental Impact Statement for Electrometallurgical Treatment of Sodium-Bonded Spent Nuclear Fuel in the Fuel Conditioning Facility at Argonne National Laboratory-West* (64 FR 8553). In this Notice of Intent, DOE invited the public to participate and comment on the proposed scope of the EIS. Subsequent to this notice, DOE held four public scoping meetings. The first meeting was attended by about 60 persons and was held in Idaho Falls, Idaho, on March 9, 1999. The second meeting was held in Boise, Idaho, on March 11, 1999, and was attended by 7 persons. Ten persons attended the third meeting, which was held in North Augusta,

South Carolina, on March 15, 1999. The fourth meeting was held in Arlington, Virginia, on March 18, 1999, and was attended by 8 persons. A court reporter recorded oral comments at each of these meetings. Written statements or comments from the public also were collected at the meetings. In addition, the public was invited to send comments to DOE by letter, e-mail via the Internet, a toll-free telephone number, and facsimile. The public scoping comment period began with the publication of the Notice of Intent in the *Federal Register* on February 22, 1999 (64 FR 8553), and ended 45 days later on April 8, 1999.

Approximately 228 comments were received during the public scoping comment period. All comments were reviewed and considered by DOE in developing the scope of this EIS. A summary of scoping comments and their disposition is provided in Appendix A of this EIS. The significant issues raised during the public scoping period are addressed below.

Many commentors at the public meetings asked specific, technical questions about the proposed action. Areas of interest included:

Waste volume reduction
Nature of the spent nuclear fuel at ANL-W
Waste forms characterization
Waste disposition and qualification (repository acceptance criteria)
Plutonium-uranium extraction (PUREX) process
Use of facilities
Nonproliferation impacts
Transportation
Demonstration project

A number of persons commented on the schedule for this EIS. Many stated that the Draft EIS should not be issued for public comment before publication of other related reports, such as the National Research Council's waste qualification assessment and Independent Assessment Final Report on the demonstration project, a nonproliferation assessment report, and an independent cost study. Several commentors said that this EIS is premature because the electrometallurgical treatment demonstration project will not be completed until after the Draft EIS is published.

Several commentors asked that the EIS include information about the costs of the proposed action and all of the technology alternatives under consideration. Other commentors stated that the public should have an opportunity to comment on the nonproliferation assessment report in the same time frame as the Draft EIS, or that this EIS should be delayed until the nonproliferation assessment becomes publicly available. Some suggested that the nonproliferation assessment be included in the EIS. A few commentors expressed the opinion that electrometallurgical treatment of spent nuclear fuel is a proliferation-prone technology.

Many waste-related comments included opinions about whether low-enriched uranium, plutonium, noble metals, and other components of the waste stream should be viewed as waste or potentially valuable resources. Several commentors asked that the EIS clarify which specific waste forms would be generated by the treatment processes. Others said the EIS should clarify whether the waste would remain at the Savannah River Site (SRS) after processing or be returned to Idaho if the PUREX process were used. Some commentors argued that the electrometallurgical treatment alternative would not reduce the volume of waste to be stored in a repository. A few questioned how DOE can ensure the waste will meet the acceptance criteria for a repository when no one knows what those criteria will be—or if there will be any repository at all. A few others recommended that the EIS evaluate the PUREX process before it is shut down to ensure that the waste forms resulting from electrometallurgical treatment are as good as the borosilicate glass that is being prepared for a geologic repository.

The commentors generally agreed that DOE should evaluate in detail all of the alternative treatment technologies that potentially could meet DOE's treatment and management needs, even those that DOE considers less technologically mature. Several commentors expressed the opinion that DOE already has made a technology decision in favor of electrometallurgical treatment, but that other alternative new technologies should not be dismissed because of a lack of knowledge about them. Some asked that the EIS: (1) explain how DOE can consider the PUREX process a reasonable alternative when, historically, it could not handle sodium-bonded spent nuclear fuel, and (2) evaluate whether changes in the PUREX process would be needed to accommodate sodium-bonded spent nuclear fuel. A few commentors suggested the EIS should analyze blanket and driver fuels separately, since they have different chemical and radiological characteristics and different treatments might be warranted.

Comments concerning environment, safety, and health issues were comparatively few, as were comments about transportation safety and security.

Comments received during the scoping period were systematically reviewed and evaluated to determine whether the issues raised fell within the scope of the EIS. The comments are addressed in the Draft EIS as indicated in Appendix A, Table A–1, which includes references to specific EIS sections.

As a result of public comment, DOE changed the proposed action of the EIS, as well as the structure of the alternatives. The proposed action was changed from electrometallurgical treatment of sodium-bonded spent nuclear fuel in the Fuel Conditioning Facility at Argonne National Laboratory-West to the treatment and management of sodium-bonded spent nuclear fuel. The title also was changed accordingly. This change was made to alleviate concerns about bias for one treatment technology over others. The alternatives were restructured to reflect differences in the characteristics of the different types of sodium-bonded spent nuclear fuel. Thus, several alternatives have been added that treat driver and blanket fuel by different technologies.

Issues related to cost and nuclear nonproliferation were not considered to be within the scope of the EIS. However, DOE is conducting a separate cost study and a nuclear nonproliferation assessment for the reasonable alternatives. In response to public comment, completion of these reports has been expedited so they are available to the public in the same time frame as the Draft EIS.

With respect to comments related to the ongoing electrometallurgical demonstration project, data from the project were used for the preparation of the Draft EIS. DOE expects that the National Research Council will issue a final report on the waste forms generated by the technology demonstration upon completion of the project in August 1999. DOE will consider the Council's final report in preparing the Final EIS and in the Record of Decision process which will follow.

The comments considered to be not within the scope of the EIS are listed in Appendix A, Table A–3, along with an explanation for their disposition.

1.4 SCOPE OF THIS EIS

The EIS evaluates the potential direct, indirect, and cumulative environmental impacts associated with the treatment of sodium-bonded spent nuclear fuel in one or more spent nuclear fuel management facilities. In addition, this EIS evaluates the environmental impacts of the No Action Alternative.

DOE proposes to treat and manage sodium-bonded spent nuclear fuel at one or more of the following spent nuclear fuel management facilities: ANL-W at INEEL and the F-Canyon or Building 105-L at SRS. The impacts from the treatment and management of sodium-bonded spent nuclear fuel at INEEL and SRS and their spent nuclear fuel management facilities are described in this EIS. In addition to the No Action Alternative, the EIS analyzes six reasonable alternatives under the proposed action that employ one or more of the

following technology options: electrometallurgical treatment, the PUREX process, packaging in high-integrity cans, and the melt and dilute treatment process. The electrometallurgical treatment at a site other than ANL-W, the GMODS process, the direct plasma arc-vitreous ceramic treatment, and the chloride volatility process were considered and deemed not to be reasonable alternatives for the proposed action.

This EIS analyzes the potential environmental impacts associated with the proposed action, which includes: (1) preparation prior to treatment; (2) treatment and management; (3) transportation; and (4) decontamination and deactivation of equipment that would be installed for the purpose of implementing a specific treatment method. Impacts from the transport to INEEL of sodium-bonded spent nuclear fuel from DOE sites such as the Hanford site in Washington, Sandia National Laboratories in New Mexico, and Oak Ridge National Laboratory in Tennessee are addressed in the Programmatic Spent Nuclear Fuel EIS (DOE 1995a).

The United States does not encourage the civilian use of plutonium and, accordingly, does not itself engage in plutonium reprocessing for either nuclear power or nuclear explosive purposes. However, one of the alternatives under the proposed action involves the separation of plutonium and highly enriched uranium. To address concerns that treatment of this fuel by chemical separation could encourage reprocessing in other countries, DOE's Office of Nonproliferation and National Security will independently evaluate the impacts of each treatment technology on U.S. nonproliferation efforts. The nonproliferation assessment report will be published at about the same time as the Draft EIS.

1.5 DECISIONS TO BE MADE

Based on the analytical results of this EIS as well as cost, schedule, and nonproliferation considerations, DOE intends to make the following decisions:

- Whether to use an existing, mature technology to treat the sodium-bonded spent nuclear fuel, and if so, which technology should be selected and where it should be implemented.

- Whether to take no action now and wait for further information regarding the potential development of a geologic repository or promote the development of a less mature or new treatment technology.

The information presented in this EIS, combined with public comments on the Draft EIS, the nonproliferation assessment report, a separate cost study of the reasonable alternatives, and the National Research Council's final evaluation of the demonstration project will enable DOE to make a decision regarding treatment and management of the sodium-bonded spent nuclear fuel.

1.6 RELATIONSHIP TO OTHER ACTIONS AND PROGRAMS

This section explains the relationship between this EIS and other relevant National Environmental Policy Act (NEPA) documents. Completed NEPA actions are described in Section 1.6.1; ongoing actions are described in Section 1.6.2.

1.6.1 Completed NEPA Actions

1.6.1.1 Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Final Environmental Impact Statement

This Programmatic Spent Nuclear Fuel EIS (DOE 1995a) analyzed at a programmatic level the potential environmental consequences of alternatives used for 40 years to transport, receive, process, and store spent nuclear fuel under DOE's responsibility. It also analyzed the consequences of 10 years of waste and spent nuclear fuel management and environmental restoration actions at Idaho National Engineering Laboratory (now known as Idaho National Engineering and Environmental Laboratory). For programmatic spent nuclear fuel management, this document analyzed alternatives that included no action, decentralization, regionalization, centralization, and the use of plans that existed in 1992 and 1993 for the management of these materials. For the Idaho National Engineering and Environmental Laboratory, this document analyzed alternatives such as no action, a 10-year plan, and minimum and maximum treatment, storage, and disposal of DOE wastes.

Issued in April 1995, the Programmatic Spent Nuclear Fuel EIS was followed by a Record of Decision published in the *Federal Register* on June 1, 1995 (60 FR 28680). In the Record of Decision, DOE decided to regionalize spent nuclear fuel management by fuel type for DOE-owned spent nuclear fuel. DOE also decided to: (1) continue environmental restoration activities at the Idaho National Engineering and Environmental Laboratory; (2) develop cost-effective treatment technologies for spent nuclear fuel and waste management; and (3) implement projects and facilities to prepare waste and treat spent nuclear fuel for interim storage and final disposition. The SBSNF EIS is being prepared as a follow-on to this programmatic EIS.

The June 1, 1995, Record of Decision was later amended to reflect the October 16, 1995, Settlement Agreement between DOE, the State of Idaho, and the Department of the Navy pertaining to spent nuclear fuel shipments into and out of the State of Idaho. The amendment to the Record of Decision was published in the *Federal Register* on March 8, 1996 (61 FR 9441). In this amendment, DOE did not modify or rescind any of the provisions presented in the June 1, 1995, Record of Decision (60 FR 28680), but reduced the number of shipments of spent nuclear fuel into the State of Idaho.

1.6.1.2 Savannah River Site Waste Management Final Environmental Impact Statement

DOE issued this EIS (DOE 1995b) to provide a basis for the selection of a site-wide approach to managing present and future (through 2024) wastes generated at SRS. These wastes would come from ongoing operations and potential actions, new missions, environmental restoration, and decontamination and decommissioning programs.

The SRS Waste Management EIS includes the treatment of wastewater discharges in the Effluent Treatment Facility, F- and H-Area tank operations and waste removal, and construction and operation of a replacement high-level radioactive waste evaporator in the H-Area tank farm. In addition, it evaluates the Consolidated Incineration Facility for the treatment of mixed waste. The Record of Decision, published in the *Federal Register* on October 30, 1995 (60 FR 55249), stated that DOE will configure its waste management system according to the moderate treatment alternative described in the EIS. The SRS Waste Management EIS evaluates management alternatives for various types of waste that actions proposed in this EIS could generate.

In a Supplemental Record of Decision published in the *Federal Register* on May 19, 1997 (62 FR 27241), DOE decided to take additional measures to further implement the Moderate Treatment Configuration Alternative for mixed waste and transuranic waste. This decision was based on the SRS Waste Management EIS and was consistent with completed negotiations between DOE and the State of South Carolina.

1.6.1.3 Final Environmental Impact Statement Interim Management of Nuclear Materials

In this EIS (DOE 1995c) DOE evaluated actions to stabilize nuclear materials at SRS that present potential environmental, safety, and health risks in their current storage condition or may present a risk within the next 10 years. As a result, DOE published five decisions from this EIS. In the Record of Decision, published in the *Federal Register* on December 19, 1995 (60 FR 65300), DOE decided to process, blend, and/or vitrify specific amounts of plutonium, uranium, americium, curium solutions, and spent nuclear fuel down to low enrichments and/or some other form of stable material. The Savannah River Site Interim Management of Nuclear Materials EIS evaluates the treatment and management of spent nuclear fuel and other wastes at SRS such as those generated by the proposed actions in the SBSNF EIS.

In the first, second, and third supplements to the Record of Decision, published in the *Federal Register* on February 21, 1996; September 13, 1996; and April 11, 1997, respectively (61 FR 6633, 61 FR 48474, and 62 FR 17790), DOE decided to stabilize additional amounts of spent nuclear fuel and other materials by processing them in the F- and H-Canyons and the FB-Line and blending the resulting highly enriched uranium down to low-enriched uranium. DOE then would transfer the resulting nuclear material to the SRS high-level radioactive waste tanks for vitrification in the Defense Waste Processing Facility.

In the fourth supplement to the Record of Decision, published in the *Federal Register* on November 14, 1997 (62 FR 61099), DOE decided to process, store, and vitrify specific amounts of nuclear material in the Defense Waste Processing Facility and to amend the September 13, 1996, supplement to the Record of Decision (61 FR 48474) to address additional amounts of plutonium and neptunium solutions stored at SRS.

1.6.1.4 Environmental Assessment for the Electrometallurgical Treatment Research and Demonstration Project in the Fuel Conditioning Facility at Argonne National Laboratory-West

This NEPA analysis (DOE 1996a) addressed the environmental impacts associated with a research and demonstration project involving the electrometallurgical treatment of up to 100 EBR-II driver assemblies and up to 25 EBR-II blanket assemblies in the Fuel Conditioning Facility at ANL-West. As noted in the environmental assessment, DOE had identified electrometallurgical treatment as a promising technology to treat EBR-II spent nuclear fuel, but an appropriate demonstration was needed to provide DOE with sufficient information to evaluate its technical feasibility. A successful demonstration of the electrometallurgical treatment technology on EBR-II spent nuclear fuel, combined with research and testing of the resulting waste forms, would provide DOE with the information needed to determine whether this treatment technology would treat the remainder of EBR-II spent nuclear fuel and/or other types of spent nuclear fuel. Based on the analysis presented in the environmental assessment, and after consideration of all the comments received from the public, DOE decided to proceed with the proposed demonstration and finalized the environmental assessment on May 15, 1995. DOE also determined that the proposed action did not constitute a major Federal action and would not necessitate the preparation of an EIS. DOE issued a Finding of No Significant Impact, which was published in the *Federal Register* on May 22, 1996 (61 FR 25647).

The electrometallurgical treatment process that was addressed in this environmental assessment is basically the same process that is being evaluated in this EIS. The process involves the dissolution of spent nuclear fuel by the use of an electric current in a molten salt mixture. The only difference between the environmental assessment and this SBSNF EIS is the amount of spent nuclear fuel being considered for treatment.

1.6.1.5 Disposition of Surplus Highly Enriched Uranium Final Environmental Impact Statement

DOE prepared this EIS (DOE 1996b) because of the need to move rapidly to neutralize the proliferation threat of surplus highly enriched uranium and to demonstrate to other nations the United States' commitment to

nonproliferation. The Highly Enriched Uranium EIS evaluates management alternatives for materials that actions proposed in this EIS could generate.

In the Record of Decision, published in the *Federal Register* on August 5, 1996 (61 FR 40619), DOE stated it would implement a program that will gradually blend as much as 85 percent of the surplus highly enriched uranium to a uranium-235 enrichment level of approximately 4 percent, and will blend the remaining surplus highly enriched uranium down to an enrichment level of about 0.9 percent for disposal as low-level radioactive waste. This will occur over 15 to 20 years. DOE could use different technologies at four potential blending facilities, including SRS and the Oak Ridge Reservation. Blending down highly enriched uranium would affect SRS operations and waste generation.

1.6.1.6 Final Waste Management Programmatic Environmental Impact Statement for Managing Treatment, Storage, and Disposal of Radioactive and Hazardous Waste

This Final Waste Management Programmatic EIS (DOE 1997) examined the potential environmental and cost impacts of strategic management alternatives for managing five types of radioactive and hazardous wastes that have resulted and will continue to result from nuclear defense and research activities at a variety of sites around the United States. The five waste types are mixed waste, low-level radioactive waste, transuranic waste, high-level radioactive waste, and hazardous waste. This programmatic EIS provided information on the impacts of various siting alternatives which DOE will use to decide at which sites to locate additional treatment, storage, and disposal capacity for each waste type. This information included the cumulative impacts of combining future siting configurations for the five waste types and the collective impacts of other past, present, and reasonably foreseeable future activities. The Programmatic EIS evaluates management and treatment alternatives for various types of waste that actions proposed in this EIS could generate.

The waste management facilities considered for the five waste types were treatment and disposal facilities for mixed waste; treatment and disposal facilities for low-level radioactive waste; treatment and storage facilities for transuranic waste in the event that treatment is required before disposal; storage facilities for treated (vitrified) high-level radioactive waste canisters; and treatment of nonwastewater hazardous waste by DOE and commercial vendors. In addition to the No Action Alternative, which included only existing or approved waste management facilities, the alternatives for each of the five waste type configurations included decentralized, regionalized, and centralized alternatives for operating existing and new waste management facilities. However, the siting, construction, and operation of any new facility at a selected site would not be decided until completion of a site-wide or project-specific environmental review.

DOE has published two decisions from this programmatic EIS. In the first Record of Decision, published in the *Federal Register* on January 23, 1998 (63 FR 3629), DOE decided that each DOE site that currently has or will generate transuranic waste will prepare and store its transuranic waste on site, except for Sandia National Laboratories in New Mexico, which will transfer its transuranic waste to the Los Alamos National Laboratory in New Mexico. Los Alamos National Laboratory will have facilities that are not available or anticipated at Sandia National Laboratories to prepare and store transuranic waste prior to disposal.

In the second Record of Decision, published in the *Federal Register* on August 5, 1998 (63 FR 41810), DOE decided to continue using offsite facilities for the treatment of major portions of the nonwastewater hazardous waste generated at DOE sites. This decision did not involve any transfer of nonwastewater hazardous waste among DOE sites.

1.6.1.7 Advanced Mixed Waste Treatment Project Final Environmental Impact Statement

This EIS (DOE 1999) assessed the potential environmental impacts associated with four alternatives related to the construction and operation of a proposed Advanced Mixed Waste Treatment Facility at INEEL. The

alternatives analyzed were: the No Action Alternative; the Proposed Action; the Nonthermal Treatment Alternative; and the Treatment and Storage Alternative. The proposed Advanced Mixed Waste Treatment Facility would treat transuranic waste, alpha-contaminated mixed waste, and mixed waste in preparation for disposal. After treatment, transuranic waste would be disposed of at the Waste Isolation Pilot Plant in New Mexico. Mixed waste would be disposed of at an approved disposal facility depending on decisions to be based on DOE's Final Waste Management Programmatic EIS (DOE 1997). Evaluations of impacts on land use; socioeconomics; cultural resources; aesthetic and scenic resources; geology; air resources; water resources; ecological resources; noise; traffic and transportation; occupational and public health and safety; INEEL services; and environmental justice were included in the assessment. The *Advanced Mixed Waste Treatment Project Final Environmental Impact Statement* addresses waste types that could be generated by actions proposed in this EIS.

In the Record of Decision, published in the *Federal Register* on April 7, 1999 (66 FR 16948), DOE decided to proceed with the construction and operation of the Advanced Mixed Waste Treatment Facility. DOE then would treat and prepare for shipment and disposal 65,000 cubic meters (2.30 million cubic feet) of DOE transuranic waste, alpha-contaminated mixed waste, and mixed wastes currently stored at INEEL. As a result of the decision to complete this facility, DOE also could treat up to 120,000 cubic meters (4.24 million cubic feet) of additional waste from INEEL or other DOE sites for a total of 185,000 cubic meters (6.53 million cubic feet). The Advanced Mixed Waste Treatment Facility will treat waste to meet the Waste Isolation Pilot Plant Waste Acceptance Criteria and applicable requirements of the Toxic Substances Control Act and the Resource Conservation and Recovery Act Land Disposal Restrictions.

In makings its decision, DOE considered several factors, including the environmental analyses reported in the Advanced Mixed Waste Treatment Project Final EIS; estimated costs of the alternatives reported in the Advanced Mixed Waste Treatment Project Environmental Impact Statement Alternatives Cost Study; regulatory implications of the alternatives; mission; national policy; and public comments on the Advanced Mixed Waste Treatment Project Draft EIS. This Record of Decision (66 FR 16948) documents DOE's decision to implement the Preferred Alternative, which provides the greatest long-term protection of the environment with small short-term environmental impacts and health risks.

1.6.2 Ongoing NEPA Actions

1.6.2.1 Savannah River Site Spent Nuclear Fuel Management Draft Environmental Impact Statement

The *Savannah River Site Spent Nuclear Fuel Management Draft Environmental Impact Statement* was issued in December 1998. The Notice of Availability was published in the *Federal Register* on December 24, 1998 (63 FR 71285). This draft SRS EIS (DOE 1998b) analyzes the potential impacts from the management of spent nuclear fuel and targets assigned to SRS, including the placing of these materials in forms suitable for ultimate disposition. Options to treat, package, and store spent nuclear fuel are discussed in this document. The material addressed by this EIS consists of approximately 68 metric tons of heavy metal of spent nuclear fuel (including 20 metric tons of heavy metal of uranium-thorium spent nuclear fuel at SRS; approximately 28 metric tons of heavy metal of aluminum-clad spent nuclear fuel from foreign and domestic research reactors to be shipped to SRS through 2035; and 20 metric tons of heavy metal of stainless steel or zirconium-clad spent nuclear fuel, as well as some other programmatic material stored at SRS for repackaging and dry storage pending shipment off site).

The alternatives considered in the SRS EIS encompass a range of new packaging, new processing, and conventional reprocessing technologies for the treatment of spent nuclear fuel. Many of these technologies are also analyzed in this SBSNF EIS. However, in the SRS EIS, DOE chose melt and dilute and conventional processing (PUREX) as preferred treatment alternatives for the spent nuclear fuel assigned to SRS.

1.6.2.2 Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nye County, Nevada, Environmental Impact Statement

This document is in preparation. DOE is assessing the potential environmental impacts from the proposed construction, operation, monitoring, and closure of an NRC-licensed geologic repository for the disposal of spent nuclear fuel and high-level radioactive waste, as mandated by the Nuclear Waste Policy Act, as amended. The Yucca Mountain EIS is required to accompany any DOE site recommendation to the President, as appropriate, under Section 114 of the Nuclear Waste Policy Act. The EIS will evaluate three thermal-loading implementation alternatives: (1) high thermal load, (2) intermediate thermal load, and (3) low thermal load. The EIS will evaluate the environmental impacts of surface and below-ground construction, operation, and eventual closure activities, as well as national and regional transportation and various packaging options for shipping spent nuclear fuel and high-level radioactive waste to the repository. The SBSNF EIS considers the potential disposal at Yucca Mountain of spent nuclear fuel or high-level radioactive waste that may result from the proposed action involving sodium-bonded spent nuclear fuel.

1.6.2.3 Idaho National Engineering and Environmental Laboratory High-Level Radioactive Waste and Facilities Disposition Environmental Impact Statement

This document is in preparation. DOE is preparing this EIS to evaluate alternatives for managing the high-level radioactive waste and associated radioactive wastes and facilities at INEEL. Under the terms of the 1995 Settlement Agreement/Consent Order with the State of Idaho, DOE agreed to treat high-level radioactive wastes currently stored at INEEL and to prepare the wastes in a form ready to be shipped out of the State of Idaho by 2035. The purpose of this EIS is to assist DOE in making decisions concerning the management of these radioactive wastes to ensure compliance with applicable laws and regulations, and protect the environment and the health and safety of the workers and the public in a cost-effective manner. This EIS evaluates treatment alternatives for wastes that actions proposed in the SBSNF EIS could generate.

In this EIS, DOE evaluates reasonable alternatives and options for the treatment of high-level radioactive waste, sodium-bearing wastes, newly generated wastes, and the disposition of facilities associated with high-level radioactive waste generation, treatment, and storage at INEEL. In addition, this EIS is integrated with the ongoing Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) program at the Idaho Nuclear Technology and Engineering Center (INTEC).

1.7 ORGANIZATION OF THE EIS

This EIS volume contains 8 chapters and 11 appendices. The main analyses are included in the chapters and additional project information is provided in the appendices. The 8 chapters provide the following information:

Chapter 1—Introduction: Background on the disposition of spent nuclear fuel; purpose and need for the proposed action; issues identified during the scoping period; decisions to be made; and relationship of this EIS to other DOE NEPA actions and programs

Chapter 2—Proposed Action and Alternatives: Descriptions of sodium-bonded spent nuclear fuel; spent nuclear fuel treatment methods; spent nuclear fuel management facilities; alternatives considered; and background information on the ultimate disposition of spent nuclear fuel

Chapter 3—Affected Environment: Aspects of the environment that could be affected by the EIS alternatives

Chapter 4—Environmental Consequences: Analyses of the potential impacts of the EIS alternatives on the environment

Chapter 5—Environmental Laws, Regulations, and Consultations: Environmental, safety, and health regulations that would apply for this EIS's alternatives and the agencies consulted for their expertise

Chapters 6-9—Glossary; a list of preparers; a list of agencies, organizations, and persons to whom copies of this EIS were sent; and index

The 11 appendices contain the following information: public scoping process and comment disposition; methods for assessing environmental impacts; detailed technology descriptions; characteristics of sodium-bonded spent nuclear fuel; normal operational impacts on human health; facility accident impacts on human health; evaluation of human health effects of overland transportation; environmental justice analysis; scientific terminology for ecological resources; *Federal Register* notices; and a contractor disclosure statement.

1.8 REFERENCES

DOE (U.S. Department of Energy), 1995a, *Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Final Environmental Impact Statement,* DOE/EIS-0203-F, Idaho Operations Office, Idaho Falls, Idaho, April.

DOE (U.S. Department of Energy), 1995b, *Savannah River Site Waste Management Final Environmental Impact Statement,* DOE/EIS-0217, Savannah River Operations Office, Aiken, South Carolina, October.

DOE (U.S. Department of Energy), 1995c, *Final Environmental Impact Statement, Interim Management of Nuclear Materials*, DOE/EIS-0220, Savannah River Operations Office, Aiken, South Carolina, December.

DOE (U.S. Department of Energy), 1996a, *Environmental Assessment for the Electrometallurgical Treatment Research and Demonstration Project in the Fuel Conditioning Facility at Argonne National Laboratory-West,* DOE/EA-1148, Office of Nuclear Energy, Science, and Technology, May.

DOE (U.S. Department of Energy), 1996b, *Disposition of Surplus Highly Enriched Uranium Final Environmental Impact Statement*, DOE/EIS-0240, Office of Fissile Materials Disposition, Washington, DC, June.

DOE (U.S. Department of Energy), 1997, *Final Waste Management Programmatic Environmental Impact Statement for Managing Treatment, Storage, and Disposal of Radioactive and Hazardous Waste,* DOE/EIS-0200-F, Office of Environmental Management, Washington, DC, May.

DOE (U.S. Department of Energy), 1998a, *Civilian Radioactive Waste Management System - Waste Acceptance System Requirements Document*, DOE/RW-0351, Office of Civilian Radioactive Waste Management, Washington, DC, December.

DOE (U.S. Department of Energy), 1998b, *Savannah River Site Spent Nuclear Fuel Management Draft Environmental Impact Statement*, DOE/EIS-0279D, Savannah River Operations Office, Aiken, South Carolina, December.

DOE (U.S. Department of Energy), 1999, *Advanced Mixed Waste Treatment Project Final Environmental Impact Statement*, DOE/EIS-0290, U.S. Department of Energy, Idaho National Engineering and Environmental Laboratory, Office of Environmental Management, Idaho Operations Office, Idaho Falls, Idaho, January.

Idaho (State of Idaho), 1995, Settlement Agreement and Consent Order, *Public Service Company of Colorado v. Batt*, No. CV 91-0035-S-EJL (D. Id.), and *United States v. Batt*, No. CV 91-0054-EJL (D. ID.), October 17.

NAS (National Academy of Sciences), 1995, *An Assessment of Continued R&D into an Electrometallurgical Approach for Treating DOE Spent Nuclear Fuel*, Committee on Electrometallurgical Techniques for DOE Spent Fuel Treatment, Washington, DC.

NAS (National Academy of Sciences), 1998, *Electrometallurgical Techniques for U.S. Department of Energy Spent Fuel Treatment-Spring 1998 Status Report on Argonne National Laboratory's R&D Activity*, Committee on Electrometallurgical Techniques for DOE Spent Fuel Treatment, Washington, DC.